

What is Claimed:

1 1. A method for processing source data for transmission over a
2 wideband signal such that the wideband signal has reduced discrete power spectral density
3 (PSD) components, the wideband signal including wideband signal pulses, the method
4 comprising the steps of:

5 generating data symbols responsive to the source data;

6 transforming one or more of the data symbols into a frame including one or
7 more orthogonal frequency division multiplexing (OFDM) symbols;

8 selectively inverting the frame of OFDM symbols responsive to a random
9 data sequence; and

10 modulating the wideband signal pulses of the wideband signal with the
11 selectively inverted frame of OFDM symbols.

1 2. The method of claim 1, wherein the source data includes bits and the
2 generating step comprises the step of:

3 mapping bits of the source data to the data symbols using one of (i) binary
4 phase shift keying and (ii) quadrature phase shift keying.

1 3. The method of claim 1, wherein the data symbols are in a frequency
2 domain and wherein the transforming step comprises the step of:

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transforming the one or more data symbols from the frequency domain to a time domain to produce the frame including the OFDM symbols.

4. The method of claim 1, further comprising the step of:

scrambling the source data prior to the generating step.

5. The method of claim 4, wherein the scrambling step comprises the step of:

scrambling the source data using a linear feedback scheme initialized using substantially uncorrelated seeds

6. The method of claim 1, wherein the selectively inverting step comprises the steps of:

selectively inverting one or more individual OFDM symbols within the frame responsive to the random data sequence.

7. The method of claim 1, wherein the wideband signal is an ultra wideband signal including ultra wideband signal pulses and wherein the modulating step comprises the step of:

modulating the ultra wideband signal pulses of the ultra wideband signal with the selectively inverted frame of OFDM symbols.

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1 8. The method of claim 1, wherein the wideband signal is a multi-band
2 wideband signal including wideband signal pulses and wherein the modulating step
3 comprises the step of:

4 modulating the wideband signal pulses corresponding to at least one sub-
5 band of the multi-band wideband signal with the selectively inverted frame of OFDM
6 symbols.

1 9. An apparatus for processing source data for transmission over a
2 wideband signal such that the wideband signal has reduced discrete power spectral density
3 (PSD) components, the wideband signal including wideband signal pulses, the apparatus
4 comprising:

5 a mapper configured to generate data symbols responsive to the source
6 data;

7 a transformer coupled to the mapper, the transformer configured to
8 transform one or more data symbols into a frame including one or more orthogonal
9 frequency division multiplexing (OFDM) symbols;

10 an inverter coupled to the transformer, the inverter configured to selectively
11 invert the frame of OFDM symbols; and

12 a wideband transmitter coupled to the inverter, the wideband transmitter
13 configured to modulate the wideband signal pulses of the wideband signal with the
14 selectively inverted frame of OFDM symbols.

1 10. The apparatus of claim 9, further comprising:

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2 a scrambler coupled to the mapper, the scrambler configured to scramble
3 the source data prior to mapping the source data to the data symbols.

1 11. The apparatus of claim 10, wherein the scrambler comprises:

2 a linear feedback shift register configured for initialization using seed values;

3 and

4 a memory coupled to the linear feedback shift register, the memory
5 including a set of seed values for initialing the linear feedback shift register wherein the
6 seed values are substantially uncorrelated with respect to one another.

1 12. The apparatus of claim 9, wherein the wideband transmitter is a

2 multi-band wideband transmitter.

1 13. The apparatus of claim 9, wherein the wideband transmitter is an

2 ultra wideband transmitter.

1 14. The apparatus of claim 9, wherein the data symbols are in a

2 frequency domain and the transformer is configured to transform the data symbols from
3 the frequency domain into the frame of OFDM symbols in a time domain.

4 15. The apparatus of claim 9, wherein the inverter is configured to

5 selectively invert one or more individual OFDM symbols within the frame.

1 16. A method for processing a received wideband signal having reduced

2 discrete power spectral density (PSD) components to recover source data, the wideband
3 signal including a selectively inverted frame inverted using a random data sequence, the

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frame including one or more orthogonal frequency division multiplexing (OFDM) symbols,
the method comprising the steps of:

de-modulating the wideband signal to recover the selectively inverted frame
of OFDM symbols;

selectively inverting the frame responsive to the random data sequence to
recover an original frame of OFDM symbols;

transforming the original frame of OFDM symbols into one or more data
symbols; and

generating the source data responsive to the one or more data symbols.

17. The method of claim 16, wherein the original frame is in a time
domain and wherein the transforming step comprises the step of:

transforming the original frame of OFDM symbols from the time domain to
the frequency domain to produce the one or more data symbols.

18. The method of claim 16, wherein the source data is scrambled and
wherein the method further comprising the step of:

descrambling the source data.

19. The method of claim 16, wherein the wideband signal is an ultra
wideband signal and wherein the de-modulating step comprises the step of:

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3 de-modulating the ultra wideband signal to recover the selectively inverted
4 frame of OFDM symbols.

1 20. The method of claim 16, wherein the wideband signal is a multi-band
2 wideband signal and wherein the modulating step comprises the step of:

3 de-modulating the multi-band wideband signal to recover the selectively
4 inverted frame of OFDM symbols.

1 21. An apparatus for processing a received wideband signal having
2 reduced discrete power spectral density (PSD) components to recover source data, the
3 wideband signal including a selectively inverted frame inverted using a random data
4 sequence, the frame including one or more orthogonal frequency division multiplexing
5 (OFDM) symbols, the apparatus comprising:

6 a wideband receiver configured to de-modulate the wideband signal to
7 recover the selectively inverted frame of OFDM symbols;

8 an inverter coupled to the wideband receiver, the inverter configured to
9 selectively invert the recovered selectively inverted frame of OFDM symbols using the
10 random data sequence to recover an original frame of OFDM symbols;

11 a transformer coupled to the inverter, the transformer configured to
12 transform the original frame of OFDM symbols into one or more data symbols; and

13 a mapper coupled to the transformer, the mapper configured to generate the
14 source data responsive to the one or more data symbols.

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1 22. The apparatus of claim 21, wherein the source data is scrambled and
2 wherein the apparatus further comprises:

3 a de-scrambler coupled to the mapper, the de-scrambler configured to de-
4 scramble the source data.

1 23. The apparatus of claim 21, wherein the wideband receiver is a multi-
2 band wideband receiver.

1 24. The apparatus of claim 21, wherein the wideband receiver is an ultra
2 wideband receiver.

1 25. The apparatus of claim 21, wherein the original frame is in a time
2 domain and the transformer is configured to transform the original frame of OFDM symbols
3 from the time domain into the one or more data symbols in a frequency domain.

1 26. A system for processing source data for transmission over a wideband
2 signal such that the wideband signal has reduced discrete power spectral density (PSD)
3 components, the wideband signal including wideband signal pulses, the system
4 comprising:

5 means for generating data symbols responsive to the source data;

6 means for transforming one or more of the data symbols into a frame
7 including one or more orthogonal frequency division multiplexing (OFDM) symbols;

8 means for selectively inverting the frame of OFDM symbols responsive to a
9 random data sequence; and

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means for modulating the wideband signal pulses of the wideband signal with the selectively inverted frame of OFDM symbol.

27. The system of claim 26, further comprising:

means for scrambling the source data prior to the generating step.

28. A computer readable carrier including software that is configured to control a computer to implement a wideband signal processing method embodied in a computer readable medium for processing source data for transmission over a wideband signal such that the wideband signal has reduced discrete power spectral density (PSD) components, the wideband signal including wideband signal pulses, the processing method including the steps of:

generating data symbols responsive to the source data;

transforming one or more of the data symbols into a frame including one or more orthogonal frequency division multiplexing (OFDM) symbols;

selectively inverting the frame of OFDM symbols responsive to a random data sequence; and

modulating the wideband signal pulses of the wideband signal with the selectively inverted frame of OFDM symbols.

29. The computer readable carrier of claim 28, wherein the method implemented by the computer further includes the steps of:

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3 scrambling the source data prior to the generating step.